

U.S. Patent Application Serial No. 09/884,998

REMARKS

Claims 25 and 30 have been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicants regard as their invention. It is believed that this Amendment is fully responsive to the Office Action dated October 8, 2002.

Claims 25 to 33 are presently being examined.

Claims 25 - 33 are rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

The Examiner states that claims 25 and 30 are indefinite because, for example, claimed limitations in claim 25 have not been active and positively recited in the claim. The wording "wherein" in line 1 is not a traditional transitional phrase for claim limitations, and the wording "imperfectly" in line 4 is vague and indefinite.

The applicants respectfully request reconsideration of this rejection.

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As indicated above, claims 25 and 30 have been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicants regard as their invention, and in order to correct certain informalities, including those which have been pointed out by the Examiner.

Accordingly, the withdrawal of the outstanding indefiniteness rejection under 35 USC §112, second paragraph, is in order, and is therefore respectfully solicited.

As to the merits of this case, claims 25, 26, 28 and 29 are rejected under 35 USC §103 as being unpatentable over U.S. Patent No. 6,193,820 to Girardello et al.

The Examiner alleges that Girardello et al. discloses the features including the claimed crawler belt bushing, three different hardened layers, hardness, microstructures, and its hardened outside layer to inner layer thickness ratio. The Examiner states that the difference between the reference and the claims are as follows: Girardello et al. does not explicitly disclose the inner layer is harder than the outer layer, however, the hardness according to Figures 1 and 7 are very close and either one could be higher or lower than the other. Furthermore, the Examiner states that the hardness on either layer exists in range and the range of the outer layer overlaps the inner layer. Therefore, optimization of a variable recognized in the art as a result-effective variable normally is considered to be within the ordinary skill of the art.

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Also, claims 27 and 30 - 33 are rejected under USC §103(a) as being unpatentable over the reference as applied to claims 25-26 and 28-29 above, and further in view of JP 401272719.

The Examiner alleges that the claimed subject matter is disclosed and rejected above by the cited reference except for the bushing steel composition. However, JP 401272719 in Table 1 discloses the claimed bushing steel is merely a conventional steel for bushings in the same field of endeavor or the analogous metallurgical art. Therefore, the Examiner alleges that it would have been *prima facie* obvious for an ordinary skill artisan motivated by a reasonable expectation of success to heat treat bushing as taught by Girardello et al. with conventional bushing steel, in order to obtain all of the known benefits.

The applicants respectfully request reconsideration of these rejections.

A significant distinguishable claimed structural arrangement of the applicants' claimed crawler belt bushing, as now set forth in claim 25, includes the claimed structure between the quench hardened layers being composed of one or more structures selected from the group consisting of ferrite, pearlite, bainite and martensite which are precipitated during cooling from the quenching temperature.

Furthermore, a significant distinguishable claimed structural arrangement of the applicant's claimed crawler belt bushing, as now set forth in claim 30, includes the claimed soft layer between the quench hardened layers being composed of one or more structures selected from the group consisting

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of ferrite, pearlite, bainite and martensite which are precipitated during cooling from the quenching temperature and which contain or do not contain granular cementite dispersed therein.

That is, the structure between the quench hardened layers of the applicants' claimed invention does not include sorbite, as disclosed in the cited prior art references. As such, in the applicants' claimed invention, possible quenching crack due to through hardening can be prevented, and the wear resistance can be improved by causing compression residual stress in the applicants' claimed invention.

Accordingly, a person of ordinary skill in the art would not have found the applicants' claimed invention, as now set forth in the claims, obvious under rejected under 35 USC §103 based on U.S. Patent No. 6,193,820 to Girardello et al., singly or in combination with JP 4012727719. Thus, the withdrawal of the outstanding obviousness rejections under 35 USC §103 based on U.S. Patent No. 6,193,820 to Girardello et al., singly or in combination with JP 4012727719, is in order, and is therefore respectfully solicited.

In view of the aforementioned amendments and accompanying remarks, claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Version with markings to show changes made

H:\HOME\MEL\TRANSFER\980923A AMENDMENT due 1-8-03

VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/884,998 (1)IN THE CLAIMS:

Amend claims 25 and 30 as follows:

25. (Amended) A crawler belt bushing [wherein], comprising quench hardened layers [are] formed so as to extend toward its wall core from its outer circumferential surface and from its inner circumferential surface respectively, and a soft[, imperfectly hardened]layer [is] formed between said quench hardened layers,

said quench hardened layers and said soft layer being formed such that the quench hardened layer of the outer circumferential surface has a depth greater than the depth of the quench hardened layer of the inner circumferential surface, by: (a) increasing the cooling rate of the outer circumferential surface [by first cooling of the workpiece from its inner circumferential surface] in order to reduce heat capacity at the core and by second cooling of the workpiece from its outer circumferential surface which is started a certain time after the first cooling and/or (b) increasing the cooling rate of the outer circumferential surface by first cooling of the workpiece from its inner circumferential surface in order to partially make the core unhardenable by utilizing the mass effect of the wall of the workpiece and by second cooling of the workpiece from its outer circumferential surface which is started a certain time after the first cooling,

the structure between said quench hardened layers being composed of one or more structures selected from the group consisting of ferrite, pearlite, bainite and martensite which are precipitated during cooling from the quenching temperature,

said bushing being low temperature tempered.

VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/884,998 (2)

30. (Amended) A crawler belt bushing having a carbon [content of] 0.35 to 2.0 wt%, containing at least one of the alloying elements of Mn, Si, Cr, Mo and Ni, and made by a method in which

a bushing workpiece made of steel, which is through hardened by simultaneous cooling from the outer and inner circumferential surfaces of the workpiece, is induction heated from the outer circumferential surfaces of the workpiece, is induction heated from the outer circumferential surface so as to raise at least the surface temperature of the inner circumferential surface to a quenching temperature, and thereafter, a series of quenching [operation] operations comprising:

firstly cooling the workpiece from the inner circumferential surface;

1. heating the workpiece from the outer circumferential surface while [cooling] cooling the workpiece from the inner circumferential surface; and

2. then, cooling the workpiece from the outer circumferential surface,

[is performed] so as to form quench hardened layers which extend toward the wall core of the workpiece from the outer circumferential surface and from the inner circumferential surface respectively and form a soft [, imperfectly hardened] layer between said quench hardened layers,

said soft layer between the quench hardened layers being composed of one or more structures selected from the group consisting of ferrite, pearlite, bainite and martensite which are precipitated during cooling from the quenching temperature and which contain or do not contain granular cementite dispersed therein.